

## 299-E28-13 (A6791) Log Data Report

### Borehole Information:

<b>Borehole:</b> 299-E28-13 (A6791)			<b>Site:</b> 216-B-55		
<b>Coordinates (WA St Plane)</b>		<b>GWL<sup>1</sup> (ft):</b>	309.1	<b>GWL Date:</b>	02/15/07
<b>North (m)</b>	<b>East (m)</b>	<b>Drill Date</b>	<b>TOC Elevation</b>	<b>Total Depth (ft)</b>	<b>Type</b>
136484.872	573083.642	12/66	709.70 ft	368	Cable

### Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded Steel	2.8	6 5/8	6	5/16	2.8	102
Welded Steel	0	8	Unknown	0.322	0	368

### Borehole Notes:

This borehole was originally drilled in 1966 to a depth of 368 ft with an 8-in. casing. In 1984, a packer was placed at 102 ft and a 6-in. casing was introduced to this depth. The annular space between the 6- and 8-in. casings was filled with grout.

Casing diameter of the 6-in. casing was measured with a caliper and steel tape by the logging engineer. The 8-in. casing could not be measured and is assumed to be 0.322 in. thick based on the ASTM published value for schedule 40-8-in. casing. Zero depth reference for log data is the top of the 6-in. casing.

### Logging Equipment Information:

Logging System:	Gamma 4 E		Type: Serial No.:	SGLS (70%) HPGe 34TP40587A
Effective Calibration Date:	05/08/06	Calibration Reference:	DOE-EM/GJ1199-2007	
		Logging Procedure:	HGLP-MAN-002 Rev. 0	

Logging System:	Gamma 4 H (with AmBe source)		Type: Serial No.:	NMLS H310700352
Effective Calibration Date:	11/22/06	Calibration Reference: Logging Procedure:	HGLP-CC-02	
			HGLP-MAN-002, Rev. 0	

Logging System:	Gamma 4 H (without AmBe source)		Type: Serial No.:	PNLS H310700352
Effective Calibration Date:	N/A	Calibration Reference:	None required	
		Logging Procedure:	HGLP-MAN-002, Rev. 0	

### Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4 Repeat	5
Date	02/14/07	02/15/07	02/15/07	03/14/07	03/14/07
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	98.0	359.0	222.0	317.0	97.0
Finish Depth (ft)	3.0	221.0	111.0	281.0	112.0
Count Time (sec)	100	100	100	100	100
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0

**HGLP-LDR-102, Rev. 0**

Log Run	1	2	3	4 Repeat	5
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	DEF01CAB	DEF11CAB	DEF21CAB	DEF51CAB	DEF51CAB
Start File	DEF01000	DEF11000	DEF21000	DEF51000	DEF51037
Finish File	DEF01095	DEF11138	DEF21111	DEF51036	DEF51052
Post-Verification	DEF01CAA	DEF11CAA	DEF21CAA	DEF51CAA	DEF51CAA
Depth Return Error (in.)	0	- 1	- 1	N/A	- 0.25
Comments	No fine gain adjustment	No fine gain adjustment	No fine gain adjustment	No fine gain adjustment	Fine gain adjustment after file -037

**Neutron Moisture Logging System (NMLS) Log Run Information:**

Log Run	6	7	8 Repeat		
Date	03/14/07	03/15/07	03/15/07		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	308.0	251.0	260.0		
Finish Depth (ft)	250.0	102.0	240.0		
Count Time (sec)	15	15	15		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	0.25	0.25	0.25		
ft/min	N/A	N/A	N/A		
Pre-Verification	DH452CAB	DH462CAB	DH462CAB		
Start File	DH452000	DH462000	DH462602		
Finish File	DH452232	DH462601	DH462682		
Post-Verification	DH452CAA	DH462CAA	DH462CAA		
Depth Return Error (in.)	-1	N/A	- 2.5		
Comments	None	None	None		

**Passive Neutron Logging System (PNLS) Log Run Information:**

Log Run	9	10	11	12 Repeat	
Date	11/26/07	11/27/07	11/27/07	11/27/07	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	308.0	116.0	98.0	50.0	
Finish Depth (ft)	115.0	97.0	3.0	20.0	
Count Time (sec)	60	60	60	60	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	1.0	1.0	1.0	1.0	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	DH862CAB	DH872CAB	DH872CAB	DH872CAB	
Start File	DH862000	DH872000	DH872020	DH872116	
Finish File	DH862193	DH872019	DH872115	DH872146	
Post-Verification	DH862CAA	DH872CAA	DH872CAA	DH872CAA	
Depth Return Error (in.)	-1.5	0	- 0.5	- 0.5	
Comments	None	None	None	None	

**Logging Operation Notes:**

Because of the casing configuration, a centralizer was used on the sondes only between 3 and 98 ft. The moisture data were acquired below the double cased interval at 102 ft.

**Analysis Notes:**

<b>Analyst:</b>	Henwood	<b>Date:</b>	12/06/07	<b>Reference:</b>	GJO-HGLP 1.6.3, Rev. 0
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Pre-run and post-run verifications for the logging systems were performed before and after each day's data acquisition. The acceptance criteria were met.

A combined casing correction for a 0.6345-in. thick casing (0.322 + 0.315 for the 8- and 6-in. casing, respectively) was applied to the SGLS data acquired from the ground surface to 102 ft. Below 102 ft, a correction for a single 0.322-in. thick casing was applied. Moisture count rate was converted to percent volumetric moisture according to calibration for 8-in. boreholes.

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with an EXCEL worksheet template identified as G4EMay06.xls using an efficiency function and corrections for casing and dead time as determined from annual calibrations.

PNLS is performed with the same sonde as the NMLS without the AmBe source. This logging method has been shown to be effective in qualitatively detecting zones of neutron activity generated by the ( $\alpha$ ,n) reaction or spontaneous fission, which may indicate the presence of transuranic radionuclides even where no characteristic gamma emissions are detected. However, the absence of neutron activity should not be considered as definitive of the absence of transuranic radionuclides. Moreover, zones of extremely high gamma activity may affect the passive neutron log.

**Results and Interpretations:**

Cs-137 was detected with the routine data processing software at a few depth locations near the MDL. Inspection of the individual spectra indicates these detections are statistical fluctuations and are not considered valid.

KUT log data appear to be influenced by the completion materials to a depth of 102 ft and are not entirely representative of the formation sediments. Radon appears to be in the borehole during log runs 1 (3 to 98 ft) and 2 (221 to 359 ft).

Moisture content shows some variability, particularly from 250 ft to where water is encountered at approximately 309 ft.

The PNLS measurements indicated no evidence of transuranic radionuclides.

The SGLS repeat logs show good repeatability.

Total gamma data were acquired by Pacific Northwest Laboratory in 1982 in this borehole. The profile in 1982 also indicated no contamination.

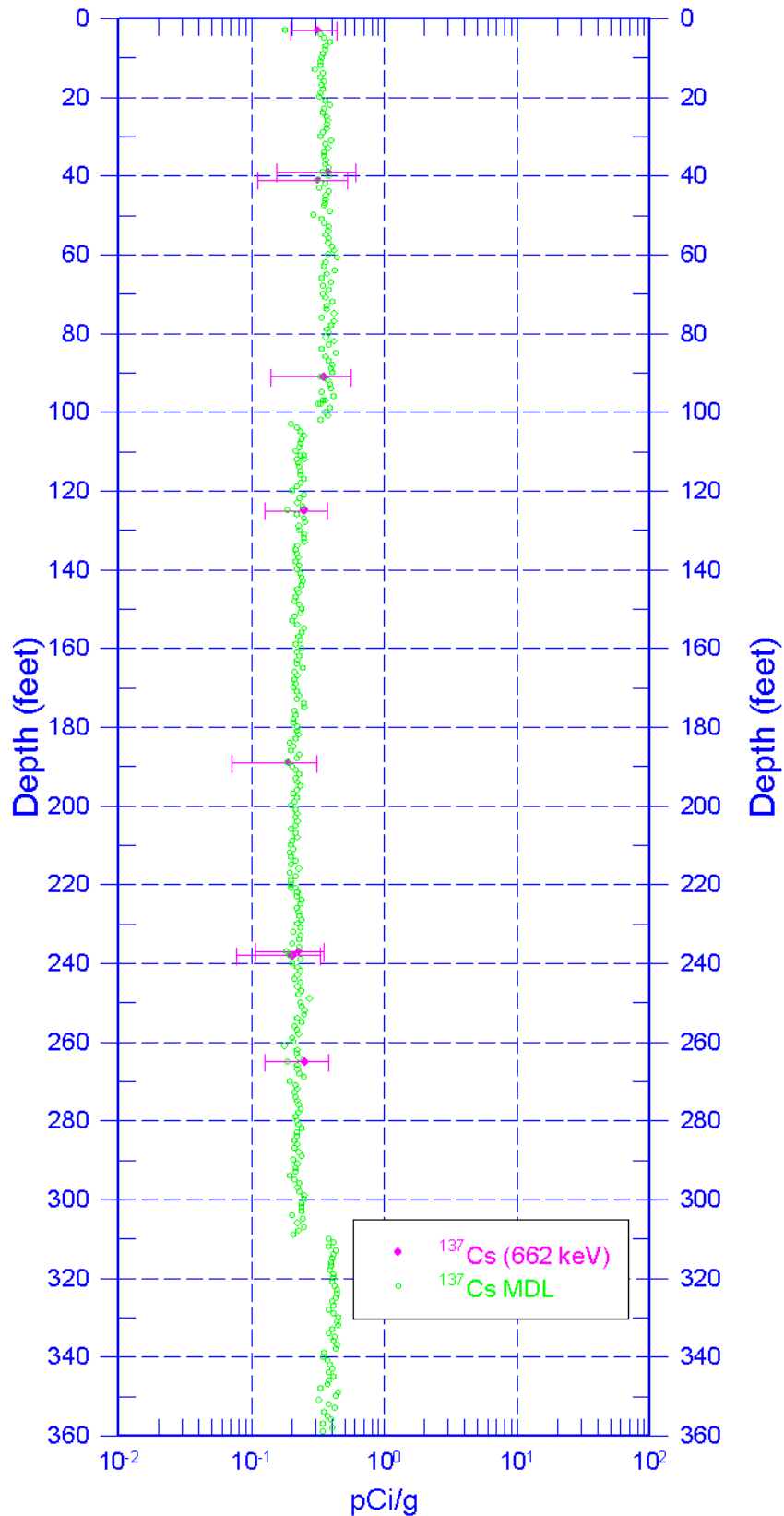
**List of Log Plots:**

Depth reference is top of casing

Manmade Radionuclides  
Natural Gamma Logs  
Combination Plot  
Total Gamma, Passive Neutron & Moisture  
Repeat Section of Natural Gamma Logs  
Moisture Repeat Data

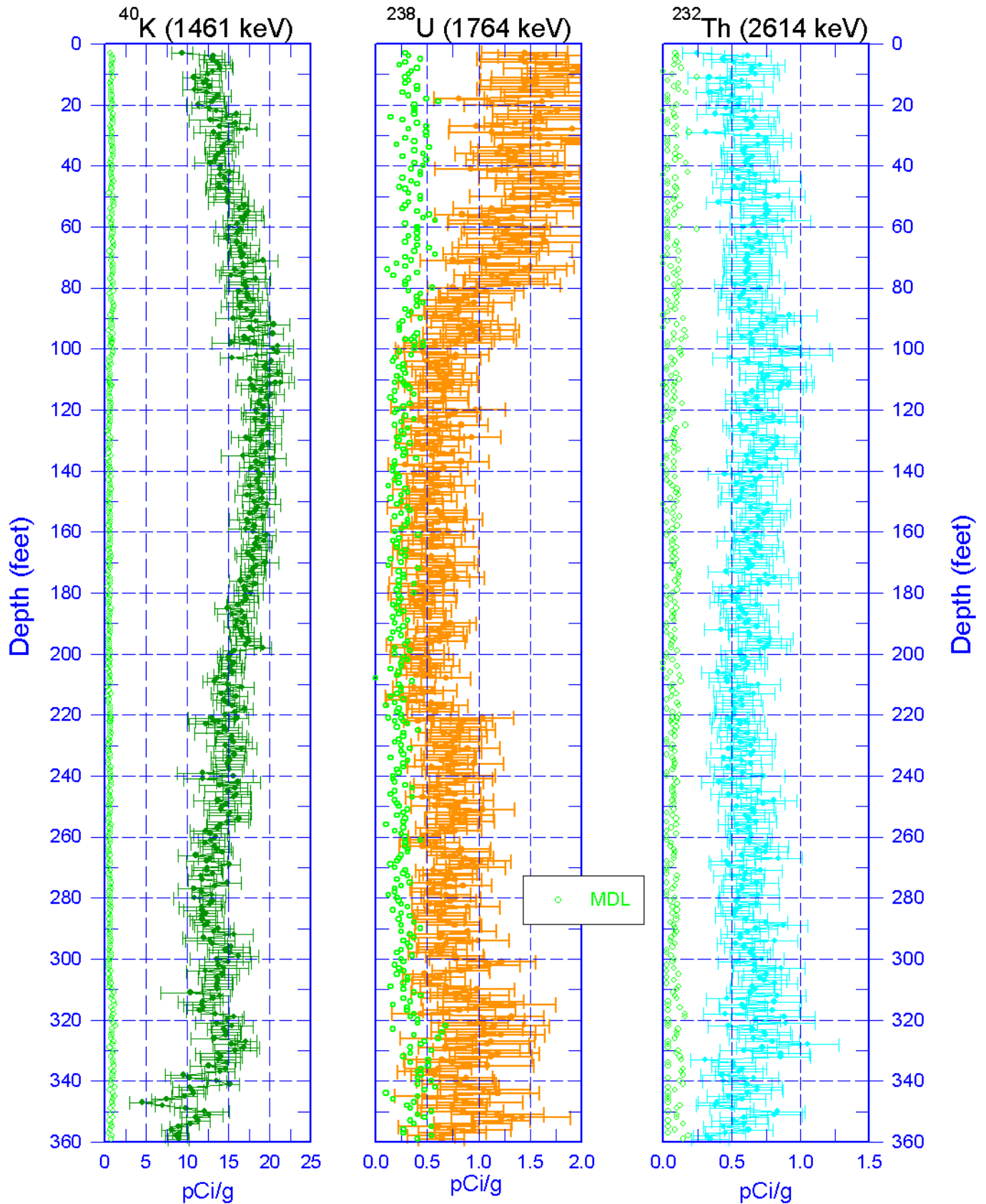
<sup>1</sup> GWL – groundwater level

## 299-E28-13 (A6791) Man-Made Radionuclides



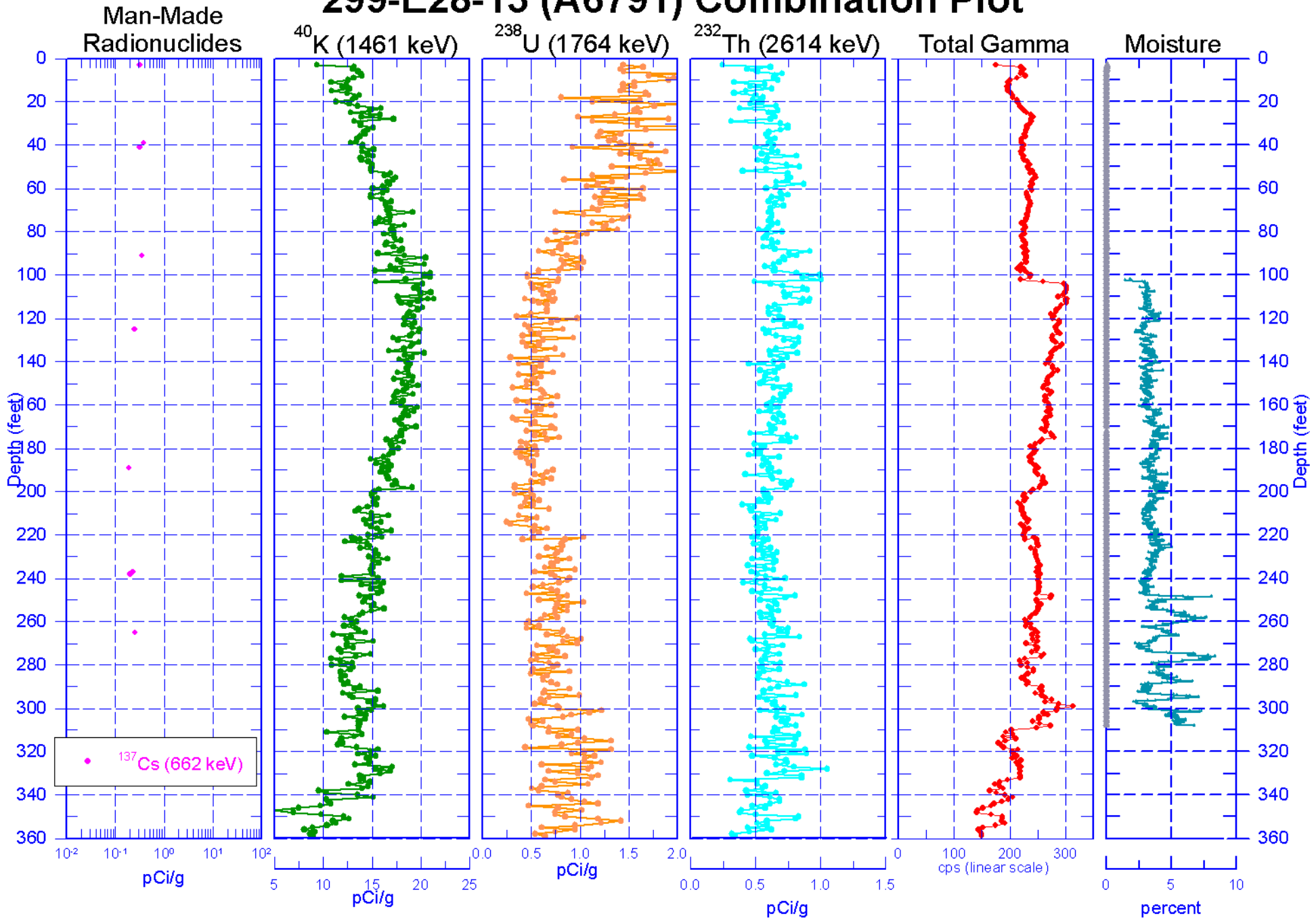
Zero Reference - Top of Casing

## 299-E28-13 (A6791) Natural Gamma Logs



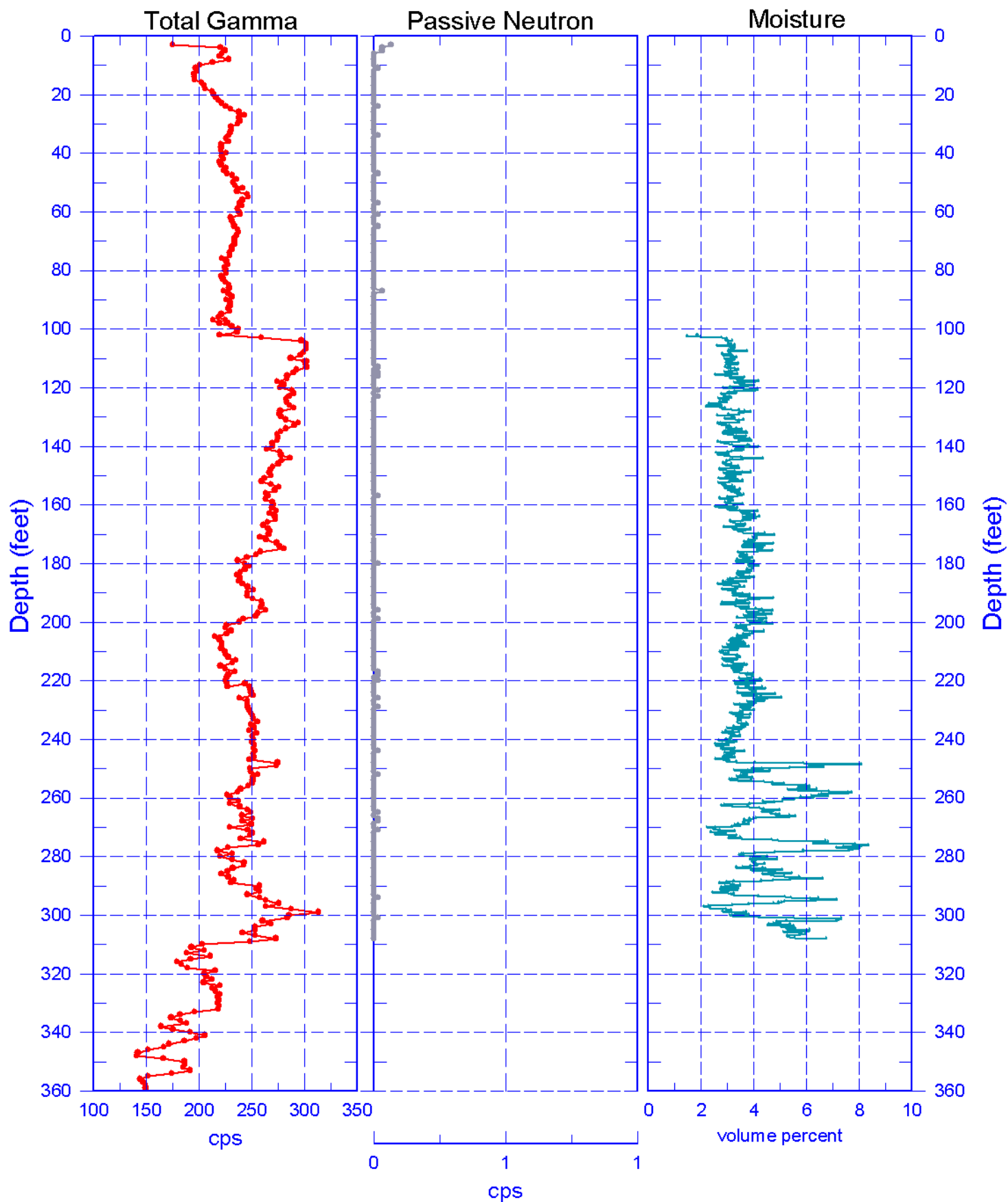
Zero Reference = Top of Casing

# 299-E28-13 (A6791) Combination Plot



299-E28-13 (A6791)

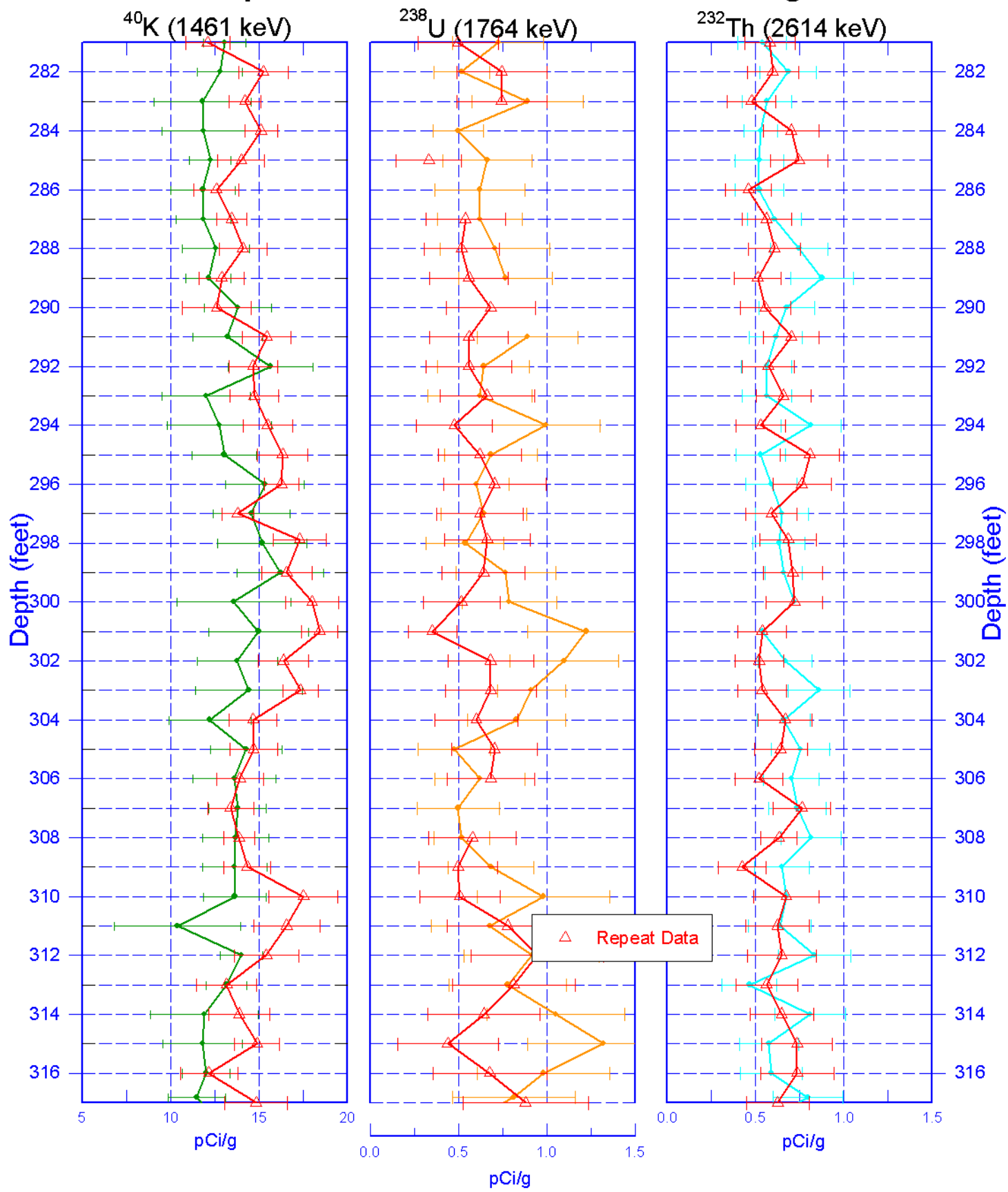
**Total Gamma, Passive Neutron & Moisture**



Reference - Top of Casing

299-E28-13 (A6791)

Repeat Section of Natural Gamma Logs



Zero Reference - Top of Casing

## 299-E28-13 (A6791) Moisture Repeat Data

